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Fifth Semester Back Examination – 2014

DATABASE MANAGEMENT SYSTEMS

BRANCH (S) : AEIE, EC, EEE, EIE, ELECTRICAL, ETC, IEE

QUESTION CODE : L 284

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.

1. Fill in the blanks :   2×10

    (a) The database applications are usually portioned into a _____ architecture or, a _____ architecture.

    (b) The degree of a relation is the number of _____ and cardinality of a relation is the number of _____ .

    (c) The major components of E-R diagram are (a) _____ (b) _____ (c) _____ (d) _____ .

    (d) The five aggregate functions provided by SQL are (a) _____ (b) _____ (c) _____ (d) _____ (e) _____ .

    (e) The left hand side and the right hand side of a functional dependency are called the (a) _____ and (b) _____ respectively.

    (f) A relation R is said to be in 2NF if it is in _____ and every non-prime attributes of R is _____ on primary key of R.

    (g) A query processor transforms a _____ query into an _____ that performs the required retrievals and manipulations in the database.

P.T.O.

(h) The ACID properties of a transaction are (a) _____ (b) _____ (c) _____ (d) _____ .

(i) When a transaction follows 2PL, in shrinking phase, it releases _____ and cannot obtain any _____ lock.

(j) Recovery is required to protect the database from (a) _____ and (b) _____ .

2. (a) Describe the main characteristics of Database approach in contrast with the file-oriented approach. 5

(b) What do you mean by a data model ? Describe the different types of data models used. 5

3. (a) What is Data independence? How does the ANSI-SPARC three-tier architecture address the issue of data independence ? 5

(b) Define functional dependency. State Armstrong's axioms and inference rules of functional dependency. Explain why Armstrong's axioms are sound and complete ? 5

4. A company called M/S ABC consultants Ltd. Has an entity EMPLOYEE with a number of employees having attributes such as EMP-ID, EMP-NAME, BIRTH-DATE and CONTACT_NO. An employee may have many contact number and EMP_NAME is composed of First name, middle name and last name. The company has another entity PROJECT that has several projects having attributes such as PROJ-ID, PROJ-NAME and START-DATE. Each employee may be assigned to one or more projects, or may not be assigned to a project. A project must have at least one employee assigned and may have any number of employees assigned. An employees' billing rate may vary by project and the company wishes to record the applicable billing rate (BILL-RATE) for each employee when assigned to a particular project.

(a) By making additional assumptions, if so required, draw an E-R diagram for the above situation. 5

(b) Transform the above E-R diagram to relations. 5

5. Consider the following relational schema in which an employee can work in more than one department :

   EMPLOYEE (EMP-ID, EMP-NAME, SALARY)

   WORKS (EMP-ID, DEPT-ID)

   DEPARTMENT (DEPT-ID, DEPT-NAME, MGR-ID, FLOOR-NO)

   Express the following queries either in relational algebra or in SQL :   10

   (a) Find the names of all employees who work on the 10th floor and earn less than INR 30,000.

   (b) Find the EMP-ID of all employees who work for all departments.

   (c) Find the EMP-ID of all employees who do not work for a department located at 2nd floor.

   (d) Find the name of all employees who earn more than INR 35,000 and work in either the IT department or the computer science department.

6. (a) Consider a relation scheme R (A, B, C, D, E, F, G, H) with following set of functional dependencies :

   $$A \rightarrow BCD$$
   $$AE \rightarrow F$$
   $$E \rightarrow G$$
   $$AD \rightarrow H$$

   Decompose R into 3NF relation schemes that are both loss less and dependency preserving.   5

   (b) For a relation, R (A, B, C, D, E, F, G, H) with the following FDs :

   $$A \rightarrow BCD$$
   $$AE \rightarrow F$$
   $$E \rightarrow G$$
   $$D \rightarrow H$$

   (i) Find the Key (s) of R.

   (ii) What is the highest normal form of R ?

   (iii) Apply normalization on R until it cannot be decomposed further.   5

7. (a) What is serializability ? Draw the precedence graph of the following schedule and state whether it is serializable. If it is serializable find out its equivalent serial schedule. 5

T$_1$	T$_2$	T$_3$
Read (X)		
	Read (Z)	
		Read (X)
Read (Z)		
	Read (Y)	
		Read (Y)
Write (Y)		
	Write (Z)	
		Write (Y)
	Write (Y)	

(b) What is concurrency control? What are its objectives ? Discuss advantages and disadvantages of different concurrency control protocols. 5

8. Write short notes on any **two** : 5×2

   (a) Phases of query processing and optimization

   (b) Database failures

   (c) Database recovery.